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Data based on the single word responses children made to visually presented alphabet letter stimuli were examined and compared with earlier adult studies. One hundred and eighty sixth-grade students from two elementary schools participated in the study. The subjects responded by writing the first word they thought of beginning with the letter presented. The 26 letters of the alphabet were presented in random order, with children from one elementary school responding to upper-case letters and children from the other elementary school responding to lower-case letters. Incomplete response booklets were discarded, and others randomly discarded until a total of 70 for each school remained. Results indicated that strong associations were common across the case of the letter. Response patterns for upper- and lower-case letters were essentially the same. Some response differences between boys and girls were noted. As in the adult studies, most response patterns could be classified as subject words or nouns. The present study supports the conclusion that word frequency patterns do develop in response to alphabet letter stimuli. References and tables are included. (WB)

CHILDREN'S WORD ASSOCIATIONS TO INDIVIDUAL LETTERS

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Several studies of word associations to individual letters of the alphabet have been reported recently. These studies have been limited to adult populations and to the use of either visually presented stimuli or vocally presented stimuli. Comparisons of the two different methods of presentation have been made across studies but not within a study. The purpose of the present study was to examine elementary school children's word associations to visually presented individual letters of the alphabet.

Earlier studies with similar objectives have been reported by Anderson (1965) and by Vetter (1967). Anderson presented individual letter stimuli visually to adult subjects and had them respond either (a) with a single word or (b) continuously over a sixty second period of time. Both upper and lower case letters were used as stimuli. In the present study single word responses to upper and lower case letters were studied. Vetter presented individual letter stimuli vocally to adult subjects, thereby providing an opportunity for phonetic properties of the stimulus letters to influence their vocal responses. His subjects also responded either (a) with a single response, or (b) continuously over a sixty second period of time.

Comparison of the Anderson and Vetter findings showed great similarity between responses to vocal and visual stimuli. Results of the persent study were compared to the results of both previous studies through (a) an examination of the most frequent single word response to each letter stimulus presented vocally and visually, upper and lower case, and (b) an analysis of the pattern of noun or subject word responses made by adults and children.

In addition to the comparisons among the three studies, four specific hypotheses were tested:

1. Girls' responses are less idiosyncratic than boys'.
2. Children's responses to upper and lower case letter forms do not differ.
3. The most frequent response for each letter stimulus comes from among the "most frequent" words on the Thorndike and Lorge (1944) word list.
4. Ranking of the alphabet letters by frequency of the most common response will be inversely related to ranking of letters by total word count in the dictionary. That is, the greater the choice of words available, the smaller the agreement in responses given.

The rationale for selecting these hypotheses follows. First, in an earlier study, Otto (in press) found boys' word association responses to verbal and pictorial stimuli to be less consensual than girls' responses to the same stimuli. The second hypothesis is merely an extension of an hypothesis tested by Anderson in her study of adults' responses.

Experimental work done by Underwood and Schulz (1960) prompted the third hypothesis. They cited the results of six studies in support of their hypothesis "that in a relatively free responding situation the order of emission of verbal units is directly related to the frequency with which those units have been experienced." In the six studies the subjects were presented lists of words, one at a time for a set number of seconds, until the words were learned. In these studies it was found that words with a higher frequency on the Lorge-Thorndike word list were learned in fewer trials and subsequently recalled when necessary more readily than the words with a lower frequency.

Logically, it was expected that most frequent responses in the present study would be among high frequency words on the Thorndike and Lorge list. The fourth hypothesis is closely related, the expectation being that when the total pool of available responses is smaller, the consensuality of responses will be greater.

Method

Students from the sixth grade classrooms of two elementary schools in a small Wisconsin city were selected to participate in the study. All subjects came from regular classrooms, as opposed to a special classroom for disabled or retarded learners. In order to assure 70 usable booklets from each school, divided equally between boys and girls, the task was completed by 90 children in each school.

The 90 students from School A responded to lower case letter forms. Each student was given a small booklet containing 26 pages with a different lower case letter printed at the top of each page. To insure a random presentation of letter stimuli, Hintzman's (1966) list of one hundred random permutations of letters was used in compiling the booklets. The students were tested in groups of 30, so the testing was completed quickly and with a minimum of variance across testing situations.

After each student in the group received a booklet, the following directions were read by the examiner: "Make sure your booklet has its staple in the upper left hand corner. On the front cover write boy or girl. I do not need to know your name, just whether the booklet is a boy's or a girl's. You each have a 26 page booklet with a different letter of the alphabet printed at the top of each page. As soon as I tell you to begin, you will open your booklet and write the first word you think of that begins with the letter printed at the top of that page. If you are not sure how to spell the word you think of, spell it the way you think it sounds. I'll probably be able to tell what you meant. When you finish the first page, go on to the second page. Keep going until you've written a word on each page. There is no time limit. You will write only one word on each page of the booklet. Remember, write the first word you think of that begins with the letter you see at the top of that page. When you finish, close your booklet and wait quietly until everyone in the class has stopped writing. If there are no questions, you may begin." The directions were repeated verbatim to each group and questions regarding the task were answered. Most students finished the task in less than twenty minutes. A few booklets had to be discarded because no response had been written for the letter X. Other booklets were randomly discarded until the required 70 remained.

The 90 subjects from School B responded to upper case letter forms. Each of these students also received a small booklet containing 26 pages, only theirs had a different upper case letter printed at the top of each page. The procedure was otherwise identical to that followed with School A subjects.

Results and Discussion

The results of the present study can be compared to results tabulated under condition one of Anderson's and Vetter's studies. Condition one of those studies concerned the most frequent single word response of adults to each letter stimulus, with visual presentation (Anderson) and with vocal presentation (Vetter).

The comparison of results of all three studies is given in Table 1. Responses to upper and lower case stimuli are shown separately in columns 1 and 2 for children and columns 3 and 4 for adults. Responses to vocal stimuli are shown in column 5. Comparing these responses of children and adults, the most frequent responses to 7 of the 26 letters were identical across the five columns. Responses for six other letters involved either identical responses across 3 or 4 columns or two pairs of identical responses. Thus, children's responses were generally similar to adults' responses.

Anderson found that the "strongest association is common across the case of the letter even though the perceptual characteristics of the letter differ for upper and lower case." This was true 77 per cent of the time in the Anderson data and 65 per cent of the time for the data of the present study, a high enough percentage to lend further support to Anderson's statement. When tabulating the raw data of children's responses, it was noted that proper names appeared more often as responses to the upper case letter stimuli, as might be expected. The children seemed slightly more conscious than adults of upper and lower case as a close examination of the data would indicate. The children's most common responses to upper case letters S and T were proper names, whereas adults responded to the upper case stimulus letter I only with the pronoun I. Incidentally, I was the second most frequent response to the stimulus letter I for children. Some children, who were responding to upper case letter stimuli, capitalized all of the words they wrote whether the words were proper names or not.

In Table 2 the most frequent response patterns of the Anderson study, the Vetter study and the present study are shown without differentiation by upper and lower case. In many instances (16 out of 26 responses) the children's responses to a particular letter showed a higher frequency than adult responses showed. Since Vetter's study involved an N of 70 instead of an N of 140 as the other studies had, it would be logical not to expect the same high frequency from the Vetter data, although the previous observation holds true if one wishes to double the number of each reported Vetter response as a means of checking the statement. However, this phenomenon as it applies to the Anderson study can probably be explained through the method by which the task was presented to the different groups. The children's instructions were more explicit in that they were told to write the first word they thought of that began with the same letter as the one printed at the top of the page. Thus, the occurrence of you as the most frequent response for the letter u was not found in the children's data; whereas, this response occurred in the data for the Anderson study. In a few instances two associations were given equally often for the same letter, and when this occurred both response words have been included in the table. A few words were tabulated with an ending such as s, ed, ing, or ny included. When tabulating responses for a word such as boy, the response boys was also included in the same category. This method of tabulating variant endings followed the practice of the Anderson and Vetter studies.

Results of the present study were also compared to the results of the Anderson and Vetter studies through an analysis of the pattern of noun or subject word responses made by adults and children. A summary of the letters for which a noun or subject word response was the most frequent response made by adults and children is shown in Table 3. Children's most frequent response for each letter was in practically every situation a noun or subject word. However, the totals indicate that responses of adults were nearly as often noun or subject words.

Turning now to a discussion of the results of the four hypotheses tested in the present study, the data regarding boys' and girls' response consensuality are summarized in Tables 4 and 5. To test this first hypothesis, the numbers of boys and girls giving the most frequent response to each letter were compared. It is true that the most frequent responses of both boys and girls were identical for 13 of the 26 stimulus letters. Nevertheless, although the responses were identical, the number of girls making that particular response was greater than the number of boys making the response for 10 of the 13 letters. If one considers responses made to each of the 26 stimulus letters, regardless of identical responses to certain letters, more girls than boys gave the most frequent response to the letters in 16 out of 26 opportunities. More boys responded alike to six of the stimuli and the remaining four stimuli were responded to in equal numbers by boys and girls. The data in Table 5 serve to clarify this line of reasoning. The data generally support the first hypothesis.

Data relevant to the second hypothesis were presented when upper and lower case data of the Anderson study were compared with like data of the present study in Table 1. Anderson defined differences in first associations for the upper and lower case letters to be the response of a proper name to an upper case letter but not to a lower case letter. The second hypothesis, an extension of Anderson's statement, will, by necessity, have to define "differences" as Anderson did. It would appear, then, that upper case stimuli influenced only 4 of the 26 most frequent responses--Indian, Jack, Scot and Tom. It seems reasonable not to reject the second hypothesis since by this definition 22 of the children's responses to upper and lower case letter forms do not differ.

To test the third hypothesis it is necessary to define what is meant by "most frequent" on the Thorndike and Lorge word list. Since the data being examined represented the most frequent response by children for each stimulus letter, it is logical to analyze the responses in light of the Thorndike count of 120 juvenile books which ranked frequency of occurrence of words in approximately 4 1/2 million words. This particular Thorndike count appears as the J Column of Part I of The Teacher's Word Book of 30,000 Words. The J Column includes words from books that have been recommended for boys and girls from grade three through grade eight.

The children's most frequent responses listed in Column 1 of Table 6 include words which appeared 1,000 or more times in Column J. These words were not more finely distinguished by Thorndike in the J Column, although they can all be found in the original Thorndike count of the first thousand most common words for children. The remaining most frequent responses of children are listed in Column 2 of Table 6 along with the number of times the word occurred in the Thorndike count. An asterisk after the number indicates Thorndike's estimated count for that word. That more than half of the most frequent responses were from among the Thorndike-Lorge "most frequent" words lends modest support to hypothesis three.

The most frequent word response to each letter stimulus has been presented in yet another light in Table 7. Here the alphabet letters are ranked by total frequency of most frequent response in descending order. For example, from the children's most frequent responses, shown in column 1, the letter X is ranked first because 84 of the 140 subjects responded with the same word, x-ray, and the letter S is ranked twenty-sixth because only 7 of the 140 subjects responded consensually.

In column 2 the combined data of Anderson's and Vetter's studies were used to rank the letters in a like manner. The Thorndike-Barnhart Junior Dictionary was selected for the purpose of determining the number of word entries for each letter of the alphabet, since it was the dictionary used by the subjects of this study in their classrooms. The letters are ranked in descending order in column 3 according to the number of word entries for each letter. Statistical treatment of the rankings was based upon the Spearman rank correlation coefficient. The 26 letters were ranked according to three combinations of two variables: columns 1 and 2, columns 1 and 3, and columns 2 and 3. The correlation coefficients were .566 (children--adults), .170 (children--dictionary) and .069 (adults--dictionary). The last two correlation coefficients, which suggest an essential lack of relationship, do not demonstrate the predicted negative relationship between the size of the available pool of responses and response consensus.

Summary and Conclusions

The purpose of the present study was to examine the single word responses children would make to visually presented alphabet letter stimuli and to compare this data with earlier adult studies where stimuli were presented visually and vocally. It was felt that children's response patterns would be similar in nature to adults' response patterns and this was supported by the results. The data of this study also bore out the conclusions of the two adult studies that most responses could be classified as subject words or nouns.

It was hypothesized that girls' responses would be less idiosyncratic than boys'. This hypothesis generally held true since girls' responses were more consensual for 16 letters and boys' were more consensual for only six letters. The hypothesis that children's responses to upper and lower case letter forms would not differ was clearly supported. Likewise, data tended to support the third hypothesis that the most frequent response for each letter stimulus comes from among the "most frequent" words on the Thorndike and Lorge word list. The raw data and the statistical analysis did not substantiate the fourth hypothesis that ranking of alphabet letters by frequency of the most common response will be inversely related to ranking of letters by total word count in the dictionary.

The evidence offered by Anderson, Vetter and the present study support the conclusion that word frequency patterns do develop in response to alphabet letter stimuli. Although children's single word responses to vocal letter stimuli, as patterned after Vetter's study, have not been done, it seems likely that similar results would be obtained. Further word-letter association research should include comparing responses of good and poor readers. Such research could test the hypothesis that letters are aversive stimuli to poor readers, causing them to give more idiosyncratic responses. A second line of research would be to extend the present study to younger children. Such children might respond less consensually to letter stimuli because they are presumably less familiar with the relationship between words and letters.

Table 1

MOST FREQUENT COMMON ASSOCIATIONS TO LETTERS

	Children Upper Case N = 70		Children Lower Case N = 70		Adults (Anderson) Upper Case N = 70		Adults (Anderson) Lower Case N = 70		Adults (Vetter) Vocal N = 70	
		n		n		n		n		n
A	apple	21	apple	26	apple	14	apple	11	apple	20
B	boy (s)	12	boy	21	boy	17	boy	18	boy	12
C	cat	22	cat	27	cat	17	cat	14	cat	24
D	dog	25	dog	28	dog	21	dog	23	dog	30
E	elephant	23	elephant	21	easy	7	eat	11	every	14
F	fun (ny)	6	fight (ing)	7	fun	10	fun	11	Frank	8
G	girl	11	girl (s)	12	good	14	good	13	good	8
H	horse (s)	14	horse (s)	11	house	7	house	6	help	6
I	Indian	7								
	it	7	it	11	I	8	I	9	in	16
J	Jack (s)	15	jump	14	joy	6	jump	9	Jack	6
K	kite	11	kite	13	kill	5	kick	7	know	8
L	little	5								
	love	5	love	8	love	18	love	10	love	18
M	Mom	9	money	8	money	9	mother	10	mother	10
N	no	11	nut	9	no	17	no	12	no	8
									never	8
O	open	11	open	14	open	8	open	10	only	6
P	people	10	people	9	poor	5	poor	8	pea	6
Q	queen	16	queen	17	queer	16	queer	14	quiet	10
R	rat	11	rabbit	11	run	11	run	15	red	10
									read	10
S	Scot	5	stop	6	sex	5	sex	5	sleep	6
T	Tom	4	toy (s)	7	time	19	toy	4	Tom	6
U	under	12	umbrella	12	you	20	you	23	use	6
V	verb	8	vase	7	victory	9	victory	8	very	18
W	work	6	work	7	woman	6	water	9	win	6
									was	6
X	x-ray	37	x-ray	47	xylophone	12	xylophone	8	xylophone	30
Y	you	30	you	20	you	21	you	18	you	26
Z	zebra	33	zebra	38	zebra	25	zebra	21	zebra	18

Table 2

MOST FREQUENT ASSOCIATIONS TO LETTERS

	Children N = 140		Adults (Anderson) N = 140		Adults (Vetter) N = 70	
		n		n		n
A	apple	47	apple	25	apple	40
B	boy (s)	33	boy	35	boy	12
C	cat	49	cat	31	cat	24
D	dog	53	dog	44	dog	30
E	elephant	44	eat	11	every	14
F	fun (ny)	13	fun	21	Frank	8
G	girl	23	good	27	good	8
H	horse (s)	25	house	13	help	6
I	it	18	I	17	in	16
J	jack (s)	21	jump	9	Jack	6
K	kite	24	kick	7	know	8
L	love	13	love	28	love	18
M	mouse	16	mother	10	mother	10
N	no	16	no	29	no, never	8
O	open	25	open	18	only	6
P	people	19	poor	13	pea	6
Q	queen	33	queer	30	quiet	10
R	rabbit	20	run	26	red, read	10
S	stop, sister	7	sex	10	sleep	6
T	toy, top	9	time	19	Tom	6
U	under	19	you	43	use	6
V	very	12	victory	17	very	18
W	work	13	water	9	win, was	6
X	x-ray	84	xylophone	20	xylophone	30
Y	you	50	you	39	you	26
Z	zebra	71	zebra	46	zebra	18

Table 3

LETTERS FOR WHICH MOST FREQUENT RESPONSE WAS A NOUN OR SUBJECT WORD

Children--UC Total = 24	Children--LC Total = 25	Adults--UC Total = 21	Adults--LC Total = 21	Adults--Vocal Total = 20
A	A	A	A	A
B	B	B	B	B
C	C	C	C	C
D	D	D	D	D
E	E	F	F	F
F	F	G	G	G
G	G	H	H	H
H	H	I	I	J
I	I	J	J	L
J	J	K	K	M
K	K	L	L	N
L	L	M	M	P
M	M	N	N	Q
N	N	R	R	R
P	P	S	S	S
Q	Q	T	T	T
R	R	V	V	U
S	S	W	W	X
T	T	X	X	Y
V	U	Y	Y	Z
W	V	Z	Z	
X	W			
Y	X			
Z	Y			
	Z			

Table 4

RESPONSE PATTERNS FOR BOYS AND GIRLS

	Boys	n	Girls	n
A	apple	15	apple	32
B	boy	16	boy (s)	17
C	cat	22	cat	27
D	dog	20	dog	33
E	elephant	19	elephant	25
F	fight (ing)	6	fun (ny)	9
G	good	11	girl (s)	16
H	Hi	10	horse (s)	19
I	it	10	indian (s)	9
J	jump	8	jack (s)	12
K	kite	10	kite	14
L	love	6	love	7
M	mouse	8	Mom	8
N	no	11	nice	7
O	open	12	open	13
P	people	10	people	9
Q	queen	14	queen	19
R	run	10	rabbit	15
S	stop	6	sister	6
T	top	5	turtle	5
U	under	11	umbrella	18
V	very	7	vase	7
W	work	9	why	5
X	x-ray	40	x-ray	44
Y	you	27	you	23
Z	zebra	36	zebra	35

Table 5

LESS IDIOSYNCRATIC RESPONSES, COMPARING GIRLS AND BOYS

Girls		Boys		Equal	
apple	32	it	10	mouse, mom	8
boy	17	no	11	stop, sister	6
cat	27	people	10	top, turtle	5
dog	33	work	9	very, vase	7
elephant	25	you	27		
fan	9	zebra	36		
girl	16				
house	19				
jack (J)	12				
kite	14				
love	7				
open	13				
queen	19				
rabbit	15				
umbrella	18				
x-ray	44				

Table 6

WORD PLACEMENT IN THE THORNDIKE LIST

Column 1 Words occurring 1,000 or more times in the J Column	Column 2 Words occurring less than 1,000 times in the J Column	
boy	apple	500
girl	cat	410*
horse	dog	700*
it	elephant	287
love	fun	285*
no	jack (J)	330*
open	kite	56
people	mouse	193*
stop	queen	700*
top	rabbit	260*
under	x-ray	0
very	zebra	23
work		
you		

Table 7

RANKING OF LETTERS

Rank (high to low)	Children's most frequent word associations	Adults' most frequent word associations Anderson & Vetter data combined	Number of dictionary entries for each letter
1	X	D	S
2	Z	Y	C
3	D	Z	P
4	Y	C	A
5	C	X	D
6	A	B	B
7	E	L	M
8	B	A	R
9	Q	N	T
10	H	G	I
11	O	Q	F
12	K	M	E
13	G	R	K
14	J	T	H
15	R	F	G
16	P	O	L
17	U	V	W
18	I	I	O
19	M	E	U
20	N	H	N
21	F	P	V
22	L	J	J
23	W	S	Q
24	V	W	Y
25	T	K	Z
26	S	U	X

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